

VALUE ADDITION OF FRUITS AND VEGETABLES FOR NUTRITIONAL SECURITY

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ABSTRACT

These days, a lot of attention is being given on health and nutrition of individuals. Today, consumers demand food products, which are nutritious as well as convenient to use. Lot of focus has been given to the food products having some additional health benefits, rather than the conventional products. Food powders contain the natural flavor and health benefits, rather than artificial food flavoring substances and they can be used as natural food additives. The uses of food powders are unlimited, and they can be used to prepare processed products as well as for culinary purposes. The processing of the food in the forms which are preferred by the consumer, have long shelf life and involve low cost of production. Studies need to be carried out to optimize the processing and storage of the food products by preventing the heat and oxidative damage on the antioxidants. Hence, it is necessary both to minimize the safety and shelf life of the products and generate an easy technology, which can be used in our agro climatic and processing conditions. Thus, in the investigation, a systematic approach was followed to develop and standardize the process for the preparation of dehydrated carrot powder, tomato and ginger powder, fenugreek leaf powder, potato flour, potato grits, granules, sweet potato powder etc.

KEYWORDS: Carrot Powder, Tomato and Ginger Powder, Fenugreek Leaf Powder, Potato Flour, Potato Grits, Granules & Sweet Potato Powder etc

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INTRODUCTION

Nutritional well being is a sustainable force for health and development of people and maximization of human genetic potential. From the beginning of human history, food has been considered as the major factor in maintaining well being and health of individuals. Active ingredients in food, which are effective in promoting human health, include amino acids, fats dietary fiber, antioxidants, pigments, vitamins and minerals which are present in different food groups such as pulses, cereals, legumes, oilseeds, fruits and vegetables.

Among all these food groups, fruits and vegetables play a significant role in human nutrition, especially as a source of vitamins, minerals and dietary fiber. The different fruits and vegetables like carrots, tomatoes potatoes, ginger, green leafy vegetables and the like are important protective foods, because of their nutritional value and antioxidant properties. Value addition of such fruits and vegetables by formulation of different value added products are an important source of nutritional security.

IMPORTANCE OF FRUITS AND VEGETABLES

Fruits and vegetables, as well as roots and tuber crops are among the best sources of calories, natural vitamins and minerals essential for healthful living. Green leafy vegetables such as amaranth, spinach fenugreek leaves, chenopodium album (bathua), mint etc., and roots and tubers such as carrots are rich sources of beta carotene, the most important precursor of vitamin A in human nutrition. Beta carotene has an important antioxidant fraction, which deactivates oxygen and free radicals, and thereby, gives protection against cancer. Vitamin A is essential for normal growth and vision, reproduction, maintenance of epithelial cells, immune properties, and its deficient intake results in a decreased blood levels and low levels in serum, showing sign of vitamin A deficiency.

It has been observed that the current availability of fruits and vegetables meets only about half of the requirement of different vitamins and minerals and hence, there is a need to boost the production and handling of vegetables and fruits, to enhance the nutrition of rural and urban poor. Therefore, it becomes necessary that the processing of vegetables must be augmented by developing such techniques, which would be not only feasible but also would suffice to produce economic quality products. This makes availability of off season vegetables round the year. In India, less than 2 percent of the vegetables of the total production are being processed as against 70 percent in Brazil and 83 percent in Malaysia. The most common method for preservation of fruits and vegetables is the dehydration method. The vegetables can be dried by hot air drying method for small scale operation or by conventional tray drier or vacuum drier, and at home level can be processed by sun drying method. These dehydrated forms of vegetables may be eaten as such or may be consumed in several forms, without affecting its nutrition and palatability.

Vegetable powders such as carrot, tomato and fenugreek leaves powder can be prepared with simple technologies and can be incorporated in traditional food preparations, thereby adding value to the products and attaining food and nutrition security both.

ROLE OF PROCESSING

Vegetables are classified as green leafy vegetables, roots and tubers and others. Carrots among roots and tubers and fenugreek leaves among green leafy vegetables grown in winter season occupy an important place. These vegetables are rich sources of beta carotene and are generally marketed fresh and consumed as raw or cooked vegetables. Due to the seasonal availability, efforts are made to process the vegetables in large quantity to extend the shelf life and to make them available during rest of the year and in the areas, where they are not available. Preservation of vegetables by processing not only involves the inhibition of microbial growth, but also preserves their color, texture, flavor and nutritive value. The vegetables can be processed into different forms to extend their shelf life such as powders, grits, flakes, pulp, puree, etc.

RESEARCH STUDIES ON VALUE ADDITION OF FRUITS AND VEGETABLES

In the department of Foods and Nutrition, College of Home Science, Pantnagar, various research studies have been conducted on value addition of different fruits and vegetables such as carrots, tomatoes, potatoes, sweet potatoes, ginger, green leafy vegetables and spices, wherein different value added products have been developed from them, which are important sources of nutritional security. These are being described one by one as given below.

Tomatoes

Tomatoes are one of the most widely used and versatile vegetable crops, ranking second in importance to potatoes in many countries. Tomatoes are important both for its large consumption and richness in health related food components. Tomato (*Solanum lycopersicon*) is an herbaceous plant of Solanaceae family, which is one of the most popular protective foods, because of its lycopene content, outstanding nutritive value, antioxidant properties and a powerhouse of medicinal properties. It is a rich source of minerals like calcium, magnesium, phosphorous, iron, sodium, potassium and vitamins especially A and C. Tomatoes are consumed mainly as a raw staple food, as an ingredient in different types of food products and in the form of processed products such as powder, tomato juice, paste, puree, sauce, etc. This horticultural crop is an excellent source of health promoting compounds, being a balanced mixture of minerals and antioxidant vitamins including vitamin C and E, as well as rich in lycopene, beta carotene, thiamine, riboflavin, niacin, lutein and flavonoids such as quercetin. The main antioxidants in the tomatoes are the carotenoids specially lycopene which have the highest lycopene levels among fruits and vegetables, ascorbic acid and phenolic compounds. In addition to lycopene, violaxanthin, neoxanthin, lutein, zeaxanthin a-cryptoxanthin, b- cryptoxanthin, carotene, neurosporene, phytoene and 5, 6- epoxides are other carotenoids commonly cited in tomatoes and tomato derived products. Among the different carotenoids, lycopene, is the most abundant in human serum, with important antioxidant activity involved in prevention of several types of cancer and degenerative diseases such as cardiovascular diseases. The production of tomato, an important horticultural crop of India has increased enormously during past few decades, which emphasize more on processing and preservation of tomatoes, thereby ensuring better availability and utilization during off season. India is the fourth largest producer of tomatoes, accounting for 6.6 percent of the world production and second largest in acreage. However, due to lack of proper processing, storage and transportation facilities, enormous quantities of tomatoes are lost during the peak harvesting season in India. Being a perishable crop, tomatoes cannot be stored for a longer time, hence proper processing and storage in some preserved form during seasons of glut will ensure its availability and utilization during deficiency period. Hence, processing of tomatoes in different forms as preferred by the consumers, with long shelf life involves low cost of production. Processing of fresh tomatoes can be done to prepare the following value added products like.

- Tomato pulp
- Tomato puree
- Tomato paste
- Tomato flakes
- Canned tomatoes
- Tomato ketchup
- Tomato soup and sauce
- Tomato powder
- Dehydrated tomato

Therefore, replacement of fresh tomatoes for example, with tomato powder can facilitate the processing sector with daily cuisines and preparation during off season. Tomato powder can be used in processed products, such as soup

mixes and confectionary items.

Carrots

Carrot (*Daucus Carota L.*) is another popular root vegetable, which is cultivated and consumed throughout the world. It is well known for its nutrient contents viz., carotene and carotenoids, besides appreciable amount of vitamins and minerals such as ascorbic acid, tocopherol etc. Among roots and other vegetables, carrot is the best source of carotene, which is a precursor of vitamin A, an essential nutrient for maintaining health. Carrot possesses nutraceutical properties such as antimutagenic, chemo preventive, photo protective and immune enhancing aspects. The presence of high concentration of antioxidant carotenoids, especially beta-carotene, may account for the biological and medicinal properties of carrots. Carrot is also rich in fiber content and has been reported to be effective for its multifaceted applications, which have resulted in development of various processing operation for making different products. Carrots are widely used as an ingredient for making curry, sweet meats and soups. Carrots have been reported to be effective in the elimination of uric acid. Carrots not only prevent vitamin A deficiency, but also cancer and other diet related human diseases. It has greater cytotoxic effect against cancer cells and reduces the enzymes that promote conversion of precarcinogens to carcinogens. It may also enhance the immune system protect against stroke, high blood pressure, osteoporosis, cataract, arthritis, heart disease and urinary tract infections. Processing of carrots would ensure its availability round year and reduction in cost of transportation and storage. During winter season, when carrots are available in plenty, different processed products may be prepared and stored in air tight containers, which may be incorporated in various recipes. Different processed products of carrots are:

- Carrot juice
- Carrot powder
- Carrot flakes
- Canned carrot
- Carrot candy
- Carrot Halwa
- Carrot grits
- Carrot soup
- Carrot Dalia
- Fabricated baby foods

Carrot powder prepared by dehydrating carrots is often incorporated in traditional food products to enhance the nutritional value, and thereby produce value added products such as paratha, porridge and laddu. These processed carrot products are not only nutritionally adequate, but also qualitatively sound for an extended period, as indicated by the research study.

Spices (Ginger)

Spices have a special significance in various ways in human life, because of their specific flavor, aroma, taste and

keeping quality. Spices are generally used in a pulverized form as condiments for seasoning or garnishing foods and beverages. These are considered to act as preservative, besides improving texture and flavor of foods.

Ginger (*Zingiber Officinale*) is one of the five most important spices of India, standing next to chilli, garlic and turmeric. Ginger is an underground stem of the zingiberous herbaceous plant. It is cultivated in several parts of the world, including India. Though ginger is grown throughout India, Kerala is the highest ginger producing state. In the year 2002, the total ginger production in India was 281.16 million tones, with Kerala and Meghalaya being the highest producing states. Among various spices grown in Uttarakhand, ginger occupies an important place with the production of 27,340 tonnes from an area of 2,250 hectare in year 2006-07. Ginger rhizomes are available for harvesting every 7-9 months after planting and stages of maturity of the rhizome have a significant influence in its quality and processing.

Ginger is commonly used as a food additive, and as spice, it is used in food preparation to impart its characteristic flavor. It has been attributed with antioxidant properties, proteolytic activity and tenderizing effect. It has been attributed with antioxidant properties which widens its use in preservation of meat and meat products. Ginger has been used to treat numerous types of nausea and vomiting. Ginger's therapeutic properties effectively stimulate circulation of the blood, remove toxins from the body, clean the bowels and kidneys and nourish skin. Other uses for ginger root include the treatment of asthma, bronchitis and other respiratory problems.

Besides therapeutic properties, ginger has been attributed with antioxidant properties, proteolytic activity and tenderizing effect. Ginger widens its use in preservation of meat and meat products, besides being used in fresh form.

Ginger is used in various food preparations to impart its characteristic flavor and is probably the only spice being used in production of beverages like ginger beer, ginger ale and ginger wine.

Although ginger production is very high, but due to lack of proper storage and transportation facilities, about 20 percent of fresh ginger crop gets damaged due to respiration and microbial spoilage. Hence, it becomes necessary to process the surplus ginger in different preserved forms, which is available throughout the year. The different processed products from ginger include

- Paste
- Candy
- Preserve
- Pickle
- Chocolates
- Beverages
- Powder
- Juice
- Ice cream
- Oleoresin

- ginger ale

The research study involved development of value added products such as ginger powder, ginger ale, ginger tea.

Fenugreek Leaves

Green leafy vegetables are gaining importance, because of being good sources of vitamins, minerals and dietary fiber. Fenugreek (*Trigonella foenum graecum*) is a popular green leafy vegetable available in plenty, at lower cost during winter season. Blanching treatment is used to preserve the color and nutritional value of GLVs. Fenugreek leaf powder obtained by dehydrating fenugreek leaves has been used to prepare paratha and saag in study conducted.

Potato

Potato (*Solanum tuberosum*) is an important and extensively grown horticultural crop in India. Potato is a versatile food, which can be eaten as a staple food, as a complementary vegetable, as a snack item or processed into several forms, and in any of these roles, it enhances the nutritional quality of the diets of people. Among the root crops, potatoes top the list and have the distinction of occupying largest area under any single vegetable in the world. Potatoes are versatile as they can be consumed in various forms as boiled, fried, baked, roasted, steamed and even in several pressed forms such as French fries, chips, papad, flakes, dice, cubes, granules, flour, canned potatoes etc.

Potatoes contribute significantly to the nutritive value of a meal, as it is not only a rich source of energy, but contain good quality edible grade protein, dietary fiber, several minerals and trace elements, essential vitamins and little or negligible fat. However, besides this added advantage, the principal disadvantage associated with the crop is that, it is seasonal and the crop produced has a shorter storage life. Hence, under such circumstances, the post harvest processing of the bulky, perishable potatoes into dehydrated potato products helps to extend the storage life and also serve as a means to increase the supply in off-seasons in different forms, in a price effective manner.

With this view in mind, the research work was carried out to produce different processed products of potatoes such as

- potato flour
- potato grits
- potato flakes
- potato granules
- potato cubes

The research studies on potatoes involved preparation of different value added food products by incorporating potato flour such as idli, biscuit, sev, extruded snacks, etc. and thereby, increasing the nutritional value of the products, also potato cubes are used in preparation of different vegetables

Sweet Potato

Sweet potato (*Ipomoea batatas*) belongs to the morning glory family Convolvaceae. Sweet potato, a commonly grown root vegetable of winter season is valued for its high nutritive value, flavors and digestibility. Sweet potato is widely used in India, for food consumption after boiling, baking or frying. However, in other countries, flour of the sweet potato is

often used in biscuits, cakes and pudding. The advantage of sweet potato over other vegetables is that it has got the shorter growth period, and adverse weather conditions rarely cause a complete crop loss. Sweet potatoes often referred to as “poor people’s food” or “poor men’s crop” has difficulties in marketing and processing. Processing of sweet potato tuber increases their availability and reduces post harvest wastage. The processed products of sweet potato include:

- Sweet potato flour
- Sweet potato granules
- Canned sweet potatoes

Sweet potato flour can be incorporated in wheat flour for bread and biscuit baking, hot cakes, gruel, noodles, candy, puddings and other preparations. It can be mixed with wheat flour for making chapatti and bread. This flour functions as a stabilizing agent in ice-creams.

Sweet potatoes are an important source of dietary protein, substantial amount of vitamins (Beta carotene, B complex and vitamin C) minerals, trace elements and high energy value.

Research study involved different value added product formulated from sweet potato like kheer, gulabjamun, chapatti and puri.

CONCLUSIONS

These days, a lot of attention is being given on health and nutrition of individuals. Today, consumers demand food products, which are nutritious as well as convenient to use. Lot of focus has been given to the food products having some additional health benefits rather than the conventional products. Food powders contain the natural flavor and health benefits rather than artificial food flavoring substances, and they can be used as natural food additives. The uses of food powders are unlimited, and they can be used to prepare processed products as well as for culinary purposes. The processing of the food in the forms which are preferred by the consumer, have long shelf life and involve low cost of production. Studies need to be carried out to optimize the processing and storage of the food products, by preventing the heat and oxidative damage on the antioxidants. Thus, in the investigation, a systematic approach was followed to develop and standardize the process for the preparation of dehydrated carrot powder, tomato and ginger powder, fenugreek leaf powder, potato flour, potato grits, granules, sweet potato powder etc. Appropriate processing at the time of gluts, can be profitable to the farmers, besides making available the nutrients to the Indian dietaries, thus meeting nutritional security of the population.

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